

Single Crystal Diffractometer (SCD)

The Single Crystal Diffractometer (SCD) is used to determine the crystal structures of a wide variety of materials. Neutrons are scattered from the crystalline sample onto a ^3He -gas-filled area detector that is position sensitive and measures 25×25 cm. The wavelengths of the neutrons are determined by their time of flight from the source to the detector. To collect all the required data for a particular crystal, the orientation of the sample can be changed by rotating the goniometer about Φ and Ω .

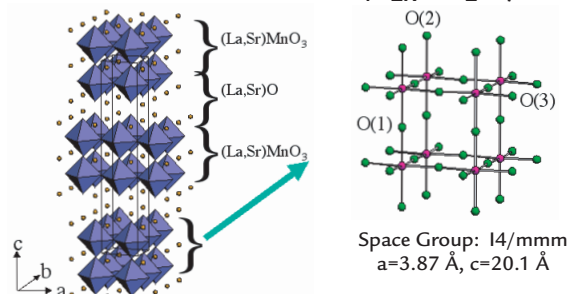
The SCD has been used to study the structure of organometallic molecules that show a unique binding of H_2 ; crystal-structure changes at solid-solid phase transitions, magnetic spin structure; twinned or multiple crystals; the texture analysis of polycrystalline materials that have been subjected to extreme geological environments; and crystal structures of materials under pressures of 10,000 to 20,000 atm. The instrument measures a large volume of reciprocal space at one time and therefore can be used for studies of unknown incommensurate structures and diffuse scattering.

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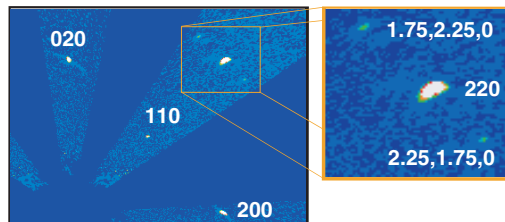


◀ Instrument scientist Yusheng Zhao adjusts the SCD instrument.

Crystal Structure of $\text{La}_{2-2x}\text{Sr}_{1+2x}\text{Mn}_2\text{O}_7$



Orbital Ordering in $\text{LaSr}_2\text{Mn}_2\text{O}_7$



Super-lattice reflections with propagation vector $q = (h+1/4, k-1/4, l)$ are observed between 210-100 K.

SCD Specifications

Wavelength range	0.5-10 Å
Beam diameter at sample	1-5 mm
Time resolution	1%
Maximum lattice constant	20 Å
Detector	1 multiwire proportional counter (25 cm x 25 cm) at 90°
Detector resolution	2.5 mm
Moderator	Chilled water at 283 K
Sample environment	10-300 K
Sample size	0.5-10 cm ³
Experiment duration	2 to 4 days per octant of reciprocal space